
THE
CUMBERLAND
COAL AND RAILWAY COMPANY.

REPORT
BY
LIONEL H. SHIRLEY,
Mem. Inst. C. E.

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MONTREAL:
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THE CUMBERLAND COAL AND RAILWAY COMPANY.

REPORT.

NOVA SCOTIA COAL.

It is many years since coal was first discovered in Nova Scotia, for in the year 1785 it appears that 1668 tons were raised, and in 1825 that the output had increased to 9,000 tons. In this year the right of mining in Nova Scotia was acquired by the Duke of York, and from him passed into the hands of a company called "The General Mining Association." This company commenced operations in various localities in the Province, and the result was an increased output. The amount mined in 1835 being 56,434 tons; in 1845, 150,674 tons; and in 1852 189,076 tons; but such a monopoly was fatal to private enterprise, and steps were taken by the provincial government for the removal of this restriction, and it was ultimately arranged with the "General Mining Association": 1st. That in all places where the Association was carrying on mining operations, a certain specified area of land should be the absolute property of the Association; and, secondly, that the Association had the privilege of claiming for mining purposes a parcel of land in the vicinity of any place where minerals were discovered,

and a sufficient time was given to the Association in which to take full advantage of these conditions. At the expiration of this term the Association lost its monopoly, and the Province was free to grant rights of search and mining leases.

NOVA SCOTIA COAL FIELD.

The Province of Nova Scotia is rich in minerals. It contains gold, silver, copper, lead and iron ores, and most of the domestic minerals. Those worked during the past year are gold, iron, copper and manganese ores, gypsum, barytes and fireclay, but above all does it abound in coal.

The millstone grit occurs at the base of the coal measures, and is more particularly developed in Cumberland and Cape Breton counties, showing that it underlies the Province from north-west to south-east.

Above this are the true coal measures considered by Dr. Dawson to average 4,000 feet in thickness. They are met in Cumberland, Pictou, Antigonish, Cape Breton, Richmond, Victoria, and Inverness counties.

The upper coal measures show sandstones, marls and shales containing seams of coal not large enough, however, to allow of profitable working; they are met in Cumberland above the true coal, and in Pictou and Colchester counties.

Beneath the millstone grit is the lower carboniferous marine formation containing limestone and gypsum.

The extent of the carboniferous measures in Nova Scotia may be roughly estimated at 5,000 square miles.

Nova Scotia coal belongs entirely to the bituminous category; it may be sub-divided in coking, cherry, and cannel coal.

It is presumed that the productive measures belong to the same horizon in geological sequence as those of Great Britain and the United States, as they present many points of similarity, both in fossils and in associated strata.

Some of the coal found in Sydney is well adapted for gas making, leaving a coke of good quality, but yields a considerable amount of smoke; while other is good for steam purposes, although inclined to clinker. Cannel coal is also found.

No coal was worked during the past year in Inverness, Richmond or Victoria counties.

The area of the Pictou coal field is estimated at 35 square miles. The mines worked are the Acadian, Albion, Vale and Intercolonial. The main seam is the principal one worked, being a good steam coal, and yields coke of a good quality, which is used by the Steel Company of Canada, at Londonderry, for their blast furnaces. The Pictou coal seams yield a considerable amount of ash; the main seam giving as much as 10.41 per cent.

The Cumberland coal field contains numerous seams of coal; some of considerable thickness. The coal is in high demand for steam purposes.

The output of coal in Nova Scotia was, in 1882, confined to these three counties. The amounts raised being as follows:

Cape Breton County,.....	9	collieries,	585,568	tons,
Pictou, "	4	"	446,137	"
Cumberland, "	5	"	218,349	"

IRON ORES IN NOVA SCOTIA.

The iron ores of Nova Scotia are of varied species, many of them of great purity. They comprise bog

ores, magnetite, clay, ironstone, specular red, hematite, spathic ores, limonite and titaniferous ore, extending in a broad band from west to east of the Province.

The ores worked at Londonderry are limonites and red hematite. Pictou County contains in addition bog ore and clay ironstone.

The labours of the Canadian Geological Survey have as yet been confined more specially to the determination of the true coal measures, and to a small portion of the Province only as regards iron ores, and doubtless other deposits are yet to be discovered.

EARLY HISTORY OF SPRING HILL MINES.

Shortly after that the Province was free from the mining restrictions, coal was accidentally discovered at Spring Hill, in the County of Cumberland, and a company was formed to work it. At that time the Intercolonial Railway was not thought of, the country was covered with dense forest, no roads existed, and the locality was twenty-seven miles from the coast. It was unsuccessfully attempted to dispose of the company's property in England. Still some good work must have been done, for in 1872, the Intercolonial Railway being in course of construction, and the country being better known, some capitalists of St. John, N.B., formed a company with a capital of \$400,000, under the name of the Spring Hill Mining Co., and bought out the old company for \$270,000. The new company was successful, and shortly after the Government granted a charter for a railway to Parrsboro', a town on Minas Basin, Bay of Fundy, the distance being 27 miles.

Business prospering, and finding their workings near the boundary somewhat limited, and requiring exten-

sion, they purchased from the General Mining Association four square miles of land with mining lease, that that Company had acquired contiguous to them. The price paid was \$200,000 in cash, and shares, and the cash payments were made out of profits from the mines. In 1874, an additional slope was made and supplied with machinery, and as a great portion of the profits had been devoted to the development of the mine, the capital was increased 25 per cent., bringing it up to \$805,000.

The output of the colliery for the last five preceding years, as taken from the company's books, was as follows :

1878.....	106,435½ tons.
1879.....	90,107½ "
1880.....	135,813½ "
1881.....	169,929 "
1882.....	201,884 "

and for the first half of 1883, 104,280 tons.

DESCRIPTION OF THE SPRING HILL MINES.

The Spring Hill mines are situated nearly in the centre of the County of Cumberland, and on the highest ground between Minas Basin and the Gulf of St. Lawrence, and are by rail distant from :

Halifax.....	122 miles.
St. John, N.B.....	154 "
Quebec	564 "
Montreal.....	722 "

Mr. Edward Gilpin, jr., Government Inspector of

Mines of Nova Scotia, gives the following section of the formation of the property :

No. 1 coal seam, north seam being worked	13 feet.
Strata.....	105 feet.
Coal seam.....	5' to 6'
Strata	130 feet.
Coal seam.....	2.4
Strata	185 feet.
No. 2 Coal seam, main or black seam being worked.....	11.0
Strata	80 feet.
No. 3 coal seam, south seam, being worked.....	11.0
Strata.....	100 feet.
Coal seam.....	8.6
Strata.....	190 feet.
Coal seam.....	4.0
Strata	176 feet.
Coal seam.....	2.9
Totals.....	62.7
	966 feet.

Shewing in a depth of 1,023 ft. 7 ins., a thickness of good workable coal of 57 ft. 7 ins. The coal to the westward of the present workings has been proved for over a mile in length by trial pits and slopes.

It is estimated that on each square mile of area of the Company's land, now being developed and worked, there is an available quantity of coal amounting to 24 millions of tons.

I am informed that other workable seams are known to exist, both underlying and overlying this group, but they have not been opened out.

The seams at present worked are :

No. 1 Seam, averaging from 13 ft. to 18 ft. in thickness.

No. 2 Seam, main or black seam, 10 ft. 6 ins. to 11 ft. in thickness.

No. 3 Seam, south seam, 11 ft. in thickness.

The land owned in fee simple consists of 6,480 acres, equal to 10 square miles, and the coal areas therein are held by lease in perpetuity direct from the Crown through the Government of Nova Scotia.

In Nova Scotia a royalty is paid to the Crown of 10 cents per ton, of 2,240 lbs. of screened coal. It is the intention of the Provincial Government to reduce this to $7\frac{1}{2}$ cents. The screenings are free of royalty.

The average inclination or dip of the coal seams is from 29 to 32 degrees towards the north-west. It is noticed that the dip flattens deeper down, indicating a coal basin, but its northern outcrop is not known. The trial pits sunk on No. 3 seam westward of the present workings and on the outcrop, show the strike to trend gradually southward. No traces of faults here have been found, and the seams preserve their normal width.

The coal is worked by slopes sunk on the seam :

No. 1 is 800 feet long on the dip.

No. 2 is 800 " " " "

No. 3 is 1,400 " " " "

No. 4 is now being sunk.

These slopes are well and strongly timbered and laid with double track. The trams are raised by winding engines fitted with wire ropes.

No. 1.—Has a pair of winding engines 15 inch cylinders, with feed pump to boilers.

No. 2.—A pair of new engines 18 inch cylinders by 3 feet stroke. A spring supplies the boilers with water.

No. 3.—A pair of new winding engines, 22 inch diameter cylinders with 3 feet stroke.

No. 4.—Single engine, 15 inch cylinder, 8 feet stroke.

In addition to the winding slopes there are foot and horseways and the necessary air-shafts down to the workings.

The drainage of the mine is well arranged, all the workings are connected by cross headings, and the whole of the underground water runs to a set of pumps at the bottom of No. 3 slope. These pumps are two of Allison's direct-acting steam pumps, 30 inch diameter cylinders with 6 feet stroke and 15 inch diameter plungers, and are supplied with steam from eight new boilers which also work No. 3 winding engine.

The pumps in reserve at the east slope are, a direct acting Blake pump, 28½ inch cylinder by 30 inch stroke, plunger 10 inches, with Guthrie's condenser attached, and a Cameron direct acting pump, 22 inch cylinder with 30 inch stroke, plunger 9 inches.

Each bank head is fitted with screens of three different meshes, classifying the coal in round, stove, nut and slack.

The coal passes from these direct into the railway wagons, the railway sidings leading under the screens.

Good arrangements are made for dumping the refuse of the pits from considerable elevations.

The ventilation of the mine is good, the air being pure, and naked lights used; ventilating shafts are provided, and a ventilating fan for forcing air into the workings has been recently fixed at slope No. 1. There has never been a gas explosion in the mine, and it is uncommonly free from gas.

The mine is substantially timbered. In working forward, two to three feet of coal roof is left; this is in

most places so strong as to require no timbering, and is taken down in working back. The floor below the coal is usually an impure fireclay or shale.

The method adopted for mining the coal is by roads or headings cut transversely to the face of the coal and rising on the slope, from which bords or endings are cut to the end of the coal, lengthways of the grain, about 350 feet in length; the headings and bords are laid with tram rails, and the coal is worked out and brought down the roads by self-acting trams worked by counterbalance weights. The average number of tons daily per cutter is four, and there are over 200 cutters employed.

The coal is a good domestic and steam coal, of bright appearance and clean fracture, it is banded but nearly all pure coal from floor to roof, the partings being exceedingly thin. The following analysis by Dr. Percy, F.R.S., is of the main seam.

Carbon.....	78.51
Hydrogen	5.19
Oxygen }	5.98
Nitrogen }	
Sulphur	1.12
Ash.....	5.20

A full set of the analysis of the main or Black seam No. 2 made by Edward Gilpin, jr., is as follows :

COMPOSITION.	Band No. 1	2	3	4	5	6	7	8	9
Moisture91	.76	1.21	.30	.63	.90	1.34	.56	.41
Vol. Comb. Mat. slow coking....	30.84	32.22	33.81	29.19	28.90	34.56	33.64	30.27	28.24
" " fast coking....	34.75	36.12	37.35	32.66	33.84	35.37	35.64	33.88	30.47
Fixed Carbon, slow coking.....	60.73	60.91	63.13	67.95	65.16	60.59	59.86	60.89	63.63
" " fast coking.....	57.82	57.01	59.69	64.48	60.22	59.98	57.58	57.28	61.
Ash.....	7.45	6.11	1.85	2.56	5.31	3.95	5.16	8.28	7.42
Sulphur85	.56	.79	1.21	1.85	.89	1.40	2.65	2.25
Spec. gravity.....	1.31	1.30	1.28	1.27	1.29	1.28	1.29	1.33	1.32
he Evap. Power, slow coking...	8.33	8.40	8.65	9.28	8.92	8.30	8.20	8.85	8.99
" " fast coking....	7.95	7.65	8.20	8.83	8.30	8.20	7.88	7.75	8.54

I do not know if analyses of the other two seams worked have been made, but the coal from them is of equal or even better quality.

The following is the analysis of the five-foot seam underlying No. 1, taken from the outcrop, air dry specimen :

Moisture	3.47
Vol. Comb: matter.....	26.98
Fixed carbon.....	64.48
Ash	5.07

This coal is compact bright and clean with conchoidal fracture.

The output from the mines is the largest of any mine in Nova Scotia, as will be seen from the following figures shewing the output for 1882 of the principal collieries :

PICTOU COUNTY.

Acadia colliery.....	105,569 tons.
Albion "	141,090 "
Intercolonial colliery.....	150,486 "

CAPE BRETON COUNTY.

Intercolonial	109,286 tons.
Sydney mines.....	156,758 "

CUMBERLAND COUNTY.

Spring Hill.....	201,884 tons.
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For the first half of 1883 the output was 104,280 tons, equal to 700 tons per diem, no coal is at present raised from No. 3, except what is cut in opening out the new workings. When the four mentioned slopes are completed and in working order, the daily output should

be at least 2000 tons daily, or say 500,000 tons per annum, and this result could be reached in twelve months from date. The amount of coal raised from each slope will depend on the number of men employed below ground I have no doubt that 500 tons daily could be brought up by each.

PLANT AND BUILDINGS.

In addition to the land and mines the Company own plant of every description, offices, workshops, *i.e.*, boiler, fitting, smiths, carpenters, &c., dwelling houses for managers, clerks, &c., 91 tenement rented to workmen, and on the building lots sold by the Company stands the little town of Spring Hill containing four churches, schools, two hotels, stores and dwelling houses, and with a population numbering over 2,000, all dependent on the prosperity of the mines. Numerous new houses are being built, I was informed that they belonged to miners who have purchased building lots from the Company.

It will be a great advantage to have men of this class settled in the place, as their labor can be depended on.

The land is covered, except such parts already cleared, with good timber, fit for building and pit-wood. A good sandstone is quarried and used for masonry.

DESCRIPTION OF SPRING HILL AND PARRSBORO RAILWAY.

The Spring Hill and Parrsboro Railway is 32 miles in length. It runs from Spring Hill Junction on the Inter-colonial Railway through the Spring Hill mines, distant 5 miles from the Junction, to Parrsboro. There are stations at Spring Hill, West Brook, Maccan, Southampton, Half Way Lake, and Parrsboro. The line is solidly built, with stone abutments to bridges, and six watering stations. It is laid throughout with new steel rails,

and sleepers. The road is newly fenced. About half the road has been lately reballasted and the remainder is being done. The grades are favorable to the load. Four way sidings are laid down at the Junction for exchange of full and empty trucks, and marshalling. The main track runs up to the passenger platform of the Intercolonial railway. A Fairbain's weigh-bridge, and narrow guage trucks, and a tipping stage, for supply of coals to the Intercolonial railway locomotives are provided, telegraph posts and wires are fixed.

ROLLING STOCK.

The rolling stock belonging to the Railway consists of:

- 4 locomotives.
- 80 hopper coal wagons (capacity, 6 tons).
- 25 flats or timber wagons.
- 10 gondolas.
- 2 passenger cars.
- 2 box cars.

PARRSBORO'.

Parrsboro' is the nearest of the Nova Scotia coal ports to the United States. It is situated on a natural harbour open all the year round except in winters of unusual severity, when it may be closed for a few weeks. Its trade consists principally of lumber and coal. Plans have been prepared for the construction of new wharfs and coal shipping stages, and the works will be commenced this coming spring, and a line of vessels established to carry coal to the New England ports.

COST OF PRODUCTION OF COAL.

The Company's books shew the average cost of production to be \$1.05 per ton; when the extensions and

improvements now in progress are completed, I am prepared to accept the managing director's assurance that this will be reduced to \$1, and to take this figure as a basis for calculation.

SELLING PRICE.

Now one ton of coal screened gives the following result: $\frac{2}{3}$ round coal and $\frac{1}{3}$ screenings; a royalty of ten cents per ton is payable on the round coal, the screenings are free. The $\frac{1}{3}$ screenings consist of stove, nut and slack in about equal proportions. The prices obtainable for these three being, for stove, \$1.50 per ton; for nut and slack together, 75 cents. The average selling price for round coal is \$2.50 per ton.

Taking then nine tons and the cost of production of same, \$9, the selling value would be:

6 tons round coal at.....	\$ 2 50	\$ 15 00
1 " stove "	1 50	1 50
2 " nut and slack coal at.....	75	1 50
Total.....		\$ 18 00

or \$2 per ton, leaving a balance of \$1 profit.

DEMAND FOR AND SALE OF COAL.

At first there was little market for the small coal, but the demand is steadily growing for house purposes, smithies, sugar and cotton factories, rolling mills, gas works, &c., at Moncton, St. John and elsewhere. Under present rates at these prices, Spring Hill coal could be sold for as under, railway shipment:

	Round.	Stove.	Small Mixed.	Railway rates, Miles. per ton.
Montreal.....	\$4 99	\$3 99	\$3 24	722 \$2 49
Quebec.....	4 19	3 19	2 44	534 1 69
Halifax.....	3 00	2 00	1 25	122 0 50
St. John.....	3 30	2 30	1 55	154 0 80

INTERCOLONIAL RAILWAY.

In 1882 the company supplied the Intercolonial Railway with 98,000 tons of coal, and have contracted to supply the railway for 1883 and two following years with 100,000 tons yearly.

The Intercolonial engineers prefer this coal to any other as it raises steam quickly and does not clinker.

DUTY ON FOREIGN COAL.

Anthracite coal imported into Canada pays a duty of 50 cents per ton. Bituminous coal pays 60 cents per ton.

DUTY TO UNITED STATES.

Canadian coal imported into the United States pays 75 cents per ton on round coal and 30 cents per ton on screenings, but since the 1st July this is so far modified that Canadian coal can be imported into the United States in bond for supplying shipping. A Bill is now before Congress to abolish the import duties on coal into the United States.

MARKET FOR COAL.

Without going as far as Quebec or Montreal I am of opinion that the natural market for the coal is to be found with the railways of Nova Scotia, the ports of the Bay of Fundy, and with the New England ports.

SHIPMENTS BY SEA TO UNITED STATES.

I am informed that there will be no difficulty in chartering vessels suitable for the coal trade, and this it is intended to do and the coal shipped to St. John and Portland, Portsmouth and Boston, U.S. Freight from Parrsboro' to these American ports will not exceed \$1.25 to \$1.50 per ton as against \$3.25 to \$4.00 from American

sources of supply, which therefore could not be laid down for less than \$4.75 to \$5.00 per ton, while Spring Hill coal could be delivered *via* Parrsboro', including duty.

Round coal.....	4.65
Stove "	2.95
Nut and slack coal.....	2.20

and netting the profits shewn on page 15.

Geographically Parrsboro' is nearer to these ports than either Pictou or Sydney, which have also the disadvantage of being closed by ice during the winter months.

FOREIGN IMPORTS.

In spite of the duties levied, the imports of foreign coal into Canada in 1881 were:

Anthracite	550,000 tons.
Bituminous.....	600,000 "
<hr/>	
	1,150,000

And the total Nova Scotia output was 1,250,000 tons. The supply is therefore not equal to the demand.

THE CUMBERLAND COAL AND RAILWAY COMPANY.

Up to last year the Spring Hill Mining Company and the Spring Hill and Parrsboro' Railway Company were perfectly distinct and separate undertakings. The Mining Company owned the railway from the mines to the junction, and the Railway Company that from the mines to Parrsboro' with running powers to the junction. The relations between the two companies were not harmonious, and in consequence of this and the inadequate wharfage accommodation, but a small percentage of coal was shipped *via* Parrsboro'. The earnings of the railway averaged from all sources—passengers, goods, building materials, lumber and coal—about \$2,000 monthly.

These two undertakings have recently been purchased by a company formed for that purpose, known as the Cumberland Coal and Railway Company, Limited, having a share capital of \$2,000,000. The following are the gentlemen who form the directorate :

President.

JOHN McDougall, Vice-President North Shore Railway, Caledonia Iron Works, etc, Montreal.

Vice-President.

ROBERT COWANS, Montreal Car Wheel Works, Montreal.

Directors.

C. C. COLBY, M.P., Stanstead, Quebec.

GEO. O. DRUMMOND, Director Bank of Montreal, President Canada Sugar Refinery, etc.

HON. ALEX. MACFARLANE, Senator, Wallace, Nova Scotia.

L. A. SENECAL, President Richelieu & Ontario Navigation Company, President North Shore Railway, etc., Montreal.

JAMES CROSSEN, Proprietor Cobourg Car Works, Ontario.

Managing Director.

R. J. LECKIE, Mining Engineer, Sherbrooke, P.Q.

Secretary.

J. R. COWANS, Montreal.

The management of the two undertakings will continue to be kept distinct under the control of the Managing Director ; that of the mines will cease to do any shipping which will in future be entirely the department of the railway. The Managing Director estimates an output of 400,000 tons during the current year, that of this 250,000 tons will be shipped *via* the junction, and 150,000 *via* Parrsboro'. The coal sent by the former route is loaded into Intercolonial wagons at the mines ; five cents per ton will be the freight to the junction, and the working expenses should not exceed 30 per

cent., thus giving a profit of \$8,750. The carriage of coal to Parrsboro' is 40 cents per ton in the company's wagons, and the working expenses will average about 50 per cent., giving \$30,000 profit, or a total net profit derived from shipment of coal of \$38,750 ; and add, from other sources, \$20,000, the net earning of the railway would amount to \$58,750 for the current year.

CONCLUSION.

Having described this considerable undertaking as briefly (considering the numerous question it embraces) as I have been able, I can add that the future of the Company promises well. The difficulties incident to the establishment of new industry in a new country have been overcome and ways of communication opened up for the carriage of produce from, and access to the mines. The fact that the Company owns the monopoly of railway communication by the shortest possible route with Parrsboro' the only port within miles on either side must be a certain source of revenue; for however many collieries may hereafter be established in their vicinity or under lease on their lands, all must ship by this route. Parrsboro' offers conveniences for the establishment of factories, and, no doubt, in time these will be built. The colliery will compare favourably with any in the old country. The workings are well timbered and ventilated, and the system of underground drainage well considered.

LIONEL H. SHIRLEY,

Mem. Inst. C.E.

Montreal, January 8th, 1884.

To C. R. HOSMER, Esq.,

President Canada Mutual Telegraph Company.